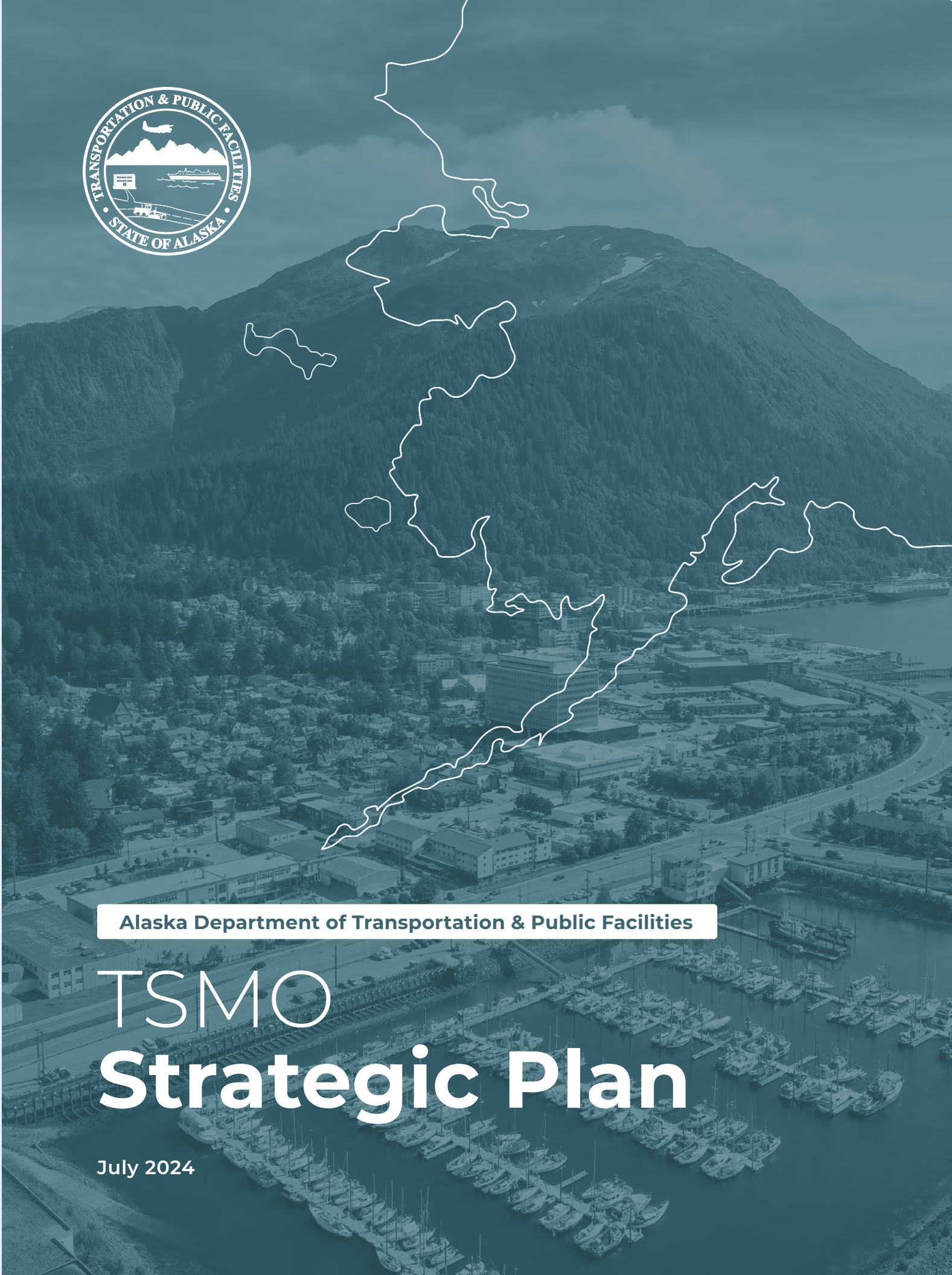

Alaska Department of Transportation & Public Facilities

TSMO Strategic Plan

July 2024

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1 Executive Summary

WHAT IS TSMO?

Transportation Systems Management and Operations (TSMO) is a broad set of strategies that aims to optimize the safe, efficient, and reliable use of existing transportation infrastructure. TSMO strategies can be systemwide and span multiple jurisdictions, agencies, and transportation modes. Traditional TSMO strategies include work zone management, road and weather management, special event management, traveler information systems, and traffic incident management. Intelligent Transportation Systems (ITS) are a common element in many TSMO strategies. Oftentimes, TSMO is expanding, integrating and improving strategies the agency already has in place.

VISION

Proactively manage and operate the existing transportation system through collaboration, optimizing existing resources, and implementing innovative and cost-effective solutions.

WHY TSMO?

Traditional approaches to improving safety and reducing congestion, such as adding capacity can be expensive and take a long time to implement. TSMO strategies can make the most of the existing system when there is limited funding. TSMO strategies are also effective in managing transportation issues given the unique size and rural nature of Alaska such as the challenges of maintaining situational awareness across vast distances. Advances in technology and changing needs from transportation system users are other reasons why TSMO may be a more effective option than traditional approaches.

INTENT OF THE ALASKA DOT&PF TSMO STRATEGIC PLAN

The intent of this Alaska Department of Transportation and Public Facilities (DOT&PF) TSMO Strategic Plan is to identify, vet and develop potential strategies for implementation by the department throughout the state.

GOALS

- Improve Safety
- Increase Reliable Travel
- Enhance User Experience
- Improve Resource Management
- Integrate TSMO into Alaska DOT&PF

TSMO: STATE OF THE AGENCY

Alaska DOT&PF has implemented TSMO strategies and started integrating TSMO into the agency culture. Completing this plan and outlining TSMO roles for existing staff will allow them to begin to take steps towards mainstreaming TSMO in the agency and becoming TSMO champions. Alaska DOT&PF staff see that creative solutions and problem solving outside of historic practices are needed due to budgeting constraints, positioning TSMO to be a great aid to the agency. Staff want TSMO to become part of the DOT&PF's routine practices and processes. More information needs to be shared internally about TSMO, so more staff members can become TSMO champions.

EXISTING TSMO STRATEGIES

Alaska DOT&PF has implemented many TSMO strategies although these strategies may not be widespread across the state. The TSMO strategies are also at different levels of maturity across the state based on each Region's history and experience with a particular strategy.

Some examples include speed feedback signs, dynamic message signs, and road condition reporting through 511.

TSMO STRATEGY RECOMMENDATIONS

The intent of this Alaska DOT&PF TSMO Strategic Plan was to identify, vet and develop strategies for implementation. Specific projects and locations are not identified in this document. The team identified strategies for implementation by working with agency staff to determine needs and problem areas. The team then reviewed national strategies and best practices to determine applicable strategies.

The recommended TSMO strategies are classified into nine categories which are based on the FHWA TSMO program areas and encompass a wide range of activities and applications. These strategies aim to enhance the overall mobility, safety and efficiency of the transportation system and ensure alignment with the Alaska DOT&PF goals and objectives.

- Arterial Management
- Active Transportation and Demand Management
- Data Collection
- Traffic Incident Management
- Road Weather Management
- Work Zone Management
- Real-time Traveler Information
- Emergency Transportation Operations
- Workforce development

TSMO PROGRAM RECOMMENDATIONS

The recommendations are for future actions to support the implementation and mainstreaming of Transportation System Management and Operation (TSMO) within the Department. The strategy and program recommendations may be implemented in partnership with other state and local agencies.

RESEARCH NEEDS

Research studies play a critical role in advancing TSMO, driving innovation, improving performance of the transportation network, and addressing the complex challenges faced by Alaska DOT&PF based on the varying topography and weather of the state.

STAFFING REQUIREMENTS

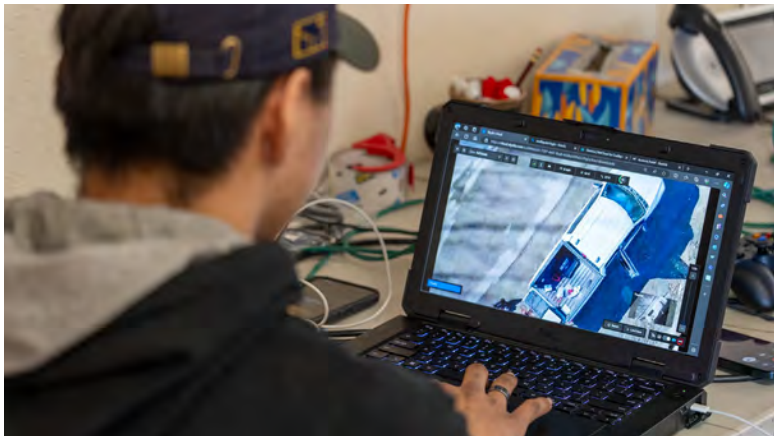
Understanding and identifying gaps in staffing to support TSMO activities within Alaska DOT&PF are key to the growth of the TSMO program. These gaps could include positions in planning, project development, maintenance and operations, IT support or performance measurement and management. Additional staffing capacity will be required in the Data Modernization and Innovation Office.

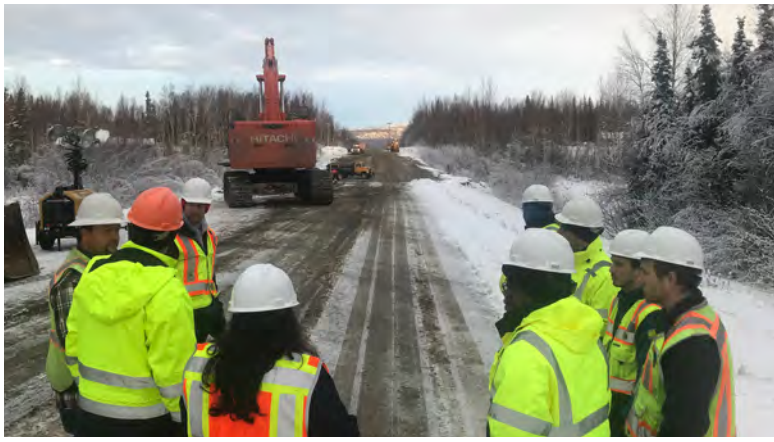
ORGANIZATIONAL STRUCTURE

Identifying potential changes to Alaska DOT&PF's organizational structure that would support the mainstreaming of TSMO and improve the effectiveness of TSMO within the agency are critical to the viability of the TSMO program.

TRAINING NEEDS

Identifying training needs for existing or future staff to support TSMO activities is a critical action necessary to expand the TSMO program and the knowledge, skills, and abilities of the staff.





POLICY AND PROCEDURES

The creation of new policies and procedures and updating current ones is important to a growing and expanding TSMO program. The new and/or updated policies and procedures aid in building consistency, standardizing activities, and ensuring continuous improvement across the program.

BUDGET

Explore setting up specific budgets for TSMO activities rather than including budget for TSMO activities in other programs. For example rather than including maintenance for DMS in the maintenance budget, this would be budgeted in the asset management portion of the TSMO budget. This way Alaska DOT&PF will understand the costs of the TSMO program, and ensure required levels of service are met.

2 Introduction

WHAT IS TSMO?

Transportation Systems Management and Operations (TSMO) is a broad set of strategies that aims to optimize the safe, efficient, and reliable use of existing transportation infrastructure. TSMO strategies are systemwide and span multiple jurisdictions, agencies, and transportation modes. Traditional TSMO strategies include work zone management, road weather management, special event management, traveler information systems, and traffic incident management. Intelligent Transportation Systems (ITS) are a common element in many TSMO strategies. Oftentimes, TSMO is integrating and improving strategies the agency already has in place.

INTENT OF THE ALASKA DOT&PF TSMO STRATEGIC PLAN

The intent of this Alaska DOT&PF TSMO Strategic Plan is to identify and develop strategies. Specific projects and locations are not located in this document, allowing Alaska DOT&PF to establish common strategies throughout the state, to then allow the Alaska DOT&PF to identify locations for improvements.

INTERNAL STAKEHOLDER OUTREACH

An internal stakeholder group of Alaska DOT&PF staff was engaged throughout the project process. This included the following meetings:

- Initial TSMO Workshop to ensure all stakeholders had a common definition of TSMO, what problems the agency would like to solve with TSMO, and common challenges with implementing TSMO within the agency
- Capability Maturity Model (CMM) Self-Assessment Workshop to assess Alaska DOT&PF's current capabilities around TSMO strategies, structure, and workforce using the Federal Highway Administration's (FHWA) CMM

- Vision, Goals, and Objectives Workshop to determine the Vision, Goals, and Objectives for the TSMO Strategic Plan
- Strengths, Weaknesses, Opportunities, and Challenges (SWOC) Workshop to reveal system gaps related to TSMO strategies and organizational structure
- TSMO Draft Strategies Workshop to review draft strategies

Internal stakeholders completed a detailed existing conditions survey. The aim of the survey was to get in depth information on the causes and effects of safety, operational, and congestion concerns. Also the survey identifies the TSMO strategies that the agency was already implementing.

After each meeting or workshop, the project team prepared detailed summaries which DOT&PF staff were able to review and provide comments so that ideas were captured correctly. Additionally DOT&PF staff reviewed the TSMO strategic plan.

VISION, GOALS, AND OBJECTIVES

The vision for the Alaska DOT&PF TSMO Strategic Plan is an aspirational statement that defines what Alaska DOT&PF hopes to achieve through the implementation of the strategies within the plan. The goals of the plan are broad statements of desired outcomes, and the objectives are specific steps or actions to help achieve the goals.

VISION

Proactively manage and operate the existing transportation system through collaboration, optimization of existing resources, and implementation of innovative, cost effective solutions.

GOALS & OBJECTIVES

Improve Safety

- Collect and analyze data to improve safety management
- Reduce crashes for vehicles, pedestrians, and bicyclists
- Improve work zone and crash site safety

Increase Reliable Travel

- Automate information related to crashes, weather, and environmental events like avalanches and wildfires
- Integrate technology with the Transportation Operations Center
- Standardize signal performance measures across the State

Enhance User Experience

- Improve the availability and consistency of existing real-time traveler information to the public
- Develop public-facing dashboards for TSMO Strategic Plan performance measures
- Develop guidelines for sharing data with the public

Improve Resource Management

- Hire dedicated Information Technology staff
- Standardize technology, guidelines, and equipment inventory management while maintaining user needs
- Develop a Data Management Plan, including internal data sharing guidelines

Integrate TSMO Into Alaska DOT&PF

- Improve the TSMO training and development of new and existing staff
- Define TSMO responsibilities throughout DOT&PF
- Incorporate TSMO in standards, manuals, and throughout the project lifecycle
- Develop maintenance and operations budgets for TSMO programs and assets

PROJECT PROCESS

- INITIAL TSMO WORKSHOP
- CMM SELF-ASSESSMENT WORKSHOP
- VISION, GOALS, AND OBJECTIVES WORKSHOP
- SWOC WORKSHOP
- EXISTING CONDITIONS SURVEY
- MAPPING THE EXISTING CONDITIONS TO THE VISION, GOALS, AND OBJECTIVES
- REVIEWING NATIONAL BEST PRACTICES
- DEVELOPING TSMO DRAFT STRATEGIES
- TSMO DRAFT STRATEGIES WORKSHOP
- TSMO PLAN DEVELOPMENT
- TSMO PLAN FINALIZATION

3 Existing Conditions

TSMO: STATE OF THE AGENCY

Alaska DOT&PF has begun integrating TSMO into the agency culture. Completing this plan and outlining TSMO roles for existing staff will allow them to begin to take steps towards implementation and become TSMO champions. Alaska DOT&PF see that creative solutions and problem solving outside of historic practices are needed due to budgeting constraints, allowing TSMO strategies to be a great aid to the agency in meeting their ongoing challenges. Staff want TSMO to become part of the DOT&PF's routine process. More information needs to be shared internally about TSMO, so each staff member can become a TSMO champion.

Each region in the agency has developed some of their own standard equipment or processes, leading to some regional silos and a lack of consistency across the state. Training for technicians, as well as maintenance and operations staff, has been inconsistent, as has performance measure data collection and reporting. Standardization across the state will allow for regions to be able to share training and best practices, streamlining activities and projects. This would additionally improve existing partnerships between DOT&PF, local agencies, and the public. DOT&PF wants to be transparent with the public about what is and what is not working and get their feedback and input on projects. Fostering positive relationships between the public and private sector will also be useful moving forward.

A Capability Maturity Model (CMM) is a well-established tool for organizational self-assessment to identify existing and goal levels of maturity for Transportation Management Systems and Operations (TSMO). A CMM workshop was held with internal Alaska DOT&PF stakeholders to identify existing and goal maturity levels within six dimensions—three process-oriented dimensions and three institutional dimensions.

PROCESS-ORIENTED DIMENSIONS

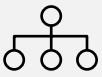
- **Business Processes** – planning, programming, budgeting, and implementation
- **Systems and Technology** – systems engineering, standards, and technology interoperability
- **Performance Measurement** – measures, data and analytics, and utilization

INSTITUTIONAL DIMENSIONS

- **Culture** – technical understanding, leadership, outreach, and program authority
- **Organization and Workforce** – organizational structure and workforce capability development
- **Collaboration** – partnerships among levels of government and with public safety agencies and private sector

The capabilities for each dimension are described as a matrix that defines the process improvement areas and levels from **Level 1** (ad hoc or performed), **Level 2** (managed), **Level 3** (integrated), to **Level 4** (optimized level of capability).

PROCESS-ORIENTED DIMENSION CAPABILITIES

DIMENSION	LEVEL 1 (PERFORMED)	LEVEL 2 (MANAGED)	LEVEL 3 (INTEGRATED)	LEVEL 4 (OPTIMIZED)
 **BUSINESS PROCESS**	Projects and processes related to TSMO are planned independently and not integrated.	A statewide TSMO plan and program is in place. It identifies deficiencies, performance measures and strategies. Staff collaborate on common goals, but it is often informal.	Planning, budgeting, and project development processes for TSMO are standardized and documented. O&M is part of transportation plans.	Processes are streamlined and continuously improved. TSMO is integrated into multi-discipline planning and programming processes.
SYSTEMS AND TECHNOLOGY	Ad hoc approaches to technology and systems procurement and implementation. Systems engineering is not a standard practice.	Systems engineering is employed and consistently used for ConOps, architecture and systems development.	Systems and technology are standardized, documented, and maintained.	Systems and technology are routinely upgraded. System integration and interoperability is maintained.
PERFORMANCE MEASUREMENT	No regular or institutionalized performance measures related to TSMO.	Performance measures are via outputs with limited after-action analysis. Data is available and dashboards are used.	Outcome measures are identified and used for system, strategy, and program improvements.	Measures are reported internally and externally, routinely used for performance management.

INSTITUTIONAL DIMENSION CAPABILITIES

DIMENSION	LEVEL 1 (PERFORMED)	LEVEL 2 (MANAGED)	LEVEL 3 (INTEGRATED)	LEVEL 4 (OPTIMIZED)
CULTURE	There are individual TSMO champions that work with other agencies as needed, but the value of TSMO is not widely understood by others.	Agency-wide understanding of the value of TSMO. Senior management is able to educate others.	TSMO is accepted as a formal core program and is part of the agency mission.	Explicit agency commitment to TSMO as a key strategy to support agency objectives such as mobility, safety, livability.
ORGANIZATION/ WORKFORCE	Fragmented roles based on legacy organizational structure and available skills. Champions are often self-identified.	TSMO specific groups are developed. They collaborate with other parts of the organization. Roles and responsibilities are identified.	High level positions and core staff for TSMO are identified in headquarters and regions. Job specifications, certifications and training for core positions are identified.	Upper-level management includes TSMO managers. Core TSMO positions are professionalized, and core capacity is identified.
COLLABORATION	Internal and external relationships are informal, personal, ad-hoc and often infrequent.	Regular collaboration at a regional level. Initial alignment of objectives and strategies with partners.	Roles and responsibilities between agencies and workgroups are collaboratively developed and documented in agreements.	High levels of TSMO collaboration between key players such as state and local agencies, and emergency service providers.

The CMM workshop was a multi-discipline effort. The lower number on the left identifies where the agency is currently on the six dimensions of the CMM. The higher number on the right identifies what the agency can achieve. All of the numbers are a consensus of the team in the workshop.

ALASKA DOT&PF CMM SELF-ASSESSMENT EXISTING AND GOAL MATURITY LEVELS

DIMENSION	LEVEL 1 (PERFORMED)	LEVEL 2 (MANAGED)	LEVEL 3 (INTEGRATED)	LEVEL 4 (OPTIMIZED)
BUSINESS PROCESS	1.4		3.1	
SYSTEMS AND TECHNOLOGY	1.6		3.4	
PERFORMANCE MEASUREMENT	1.6		3.8	
CULTURE		2.1	3.4	
ORGANIZATION/ WORKFORCE	1.8		3.2	
COLLABORATION	1.8		3.4	

EXISTING SAFETY, OPERATIONAL, AND CONGESTION CONCERNS

The consultant team surveyed internal Alaska DOT&PF staff with TSMO responsibilities. They were asked a series of questions to identify existing safety, operational, and congestion concerns related to TSMO. Alaska DOT&PF internal stakeholders identified and ranked the different concerns.

HOW THE CONCERNS MAP TO THE TSMO STRATEGIC PLAN GOALS

The respondents ranked a list of safety, operational, and congestion concerns that could be addressed by TSMO strategies. The respondents also identified additional concerns. The DKS team then determined which goal area the concerns impacted to ensure that identified concerns addressed the goals the DOT&PF developed.

SAFETY CONCERNS	IMPROVE SAFETY	INCREASE RELIABLE TRAVEL	ENHANCE USER EXPERIENCE	IMPROVE RESOURCE MANAGEMENT	INTEGRATE TSMO INTO ALASKA DOT&PF
INTERSECTIONS	○	○	○		
SPEED	○				
LANE DEPARTURES (AROUND CURVES AND STRAIGHT ROADWAYS)	○				
IMPAIRMENT, IMPATIENT, AND/OR DISTRACTED DRIVERS	○		○		
SPECIAL USERS (PEDESTRIANS, BICYCLISTS, MOTORCYCLES, OFF-HIGHWAY VEHICLES)	○				
CRASH DATA QUALITY AND AVAILABILITY	○	○		○	
ANIMAL STRIKES	○				
TRUCK CRASHES	○				
HAZMAT	○				
EMERGENCY MEDICAL SERVICES (EMS) VEHICLE TRAVEL DISTANCE / TIME	○	○		○	
MIXED USES ON ROUTES USED FOR FREIGHT MOVEMENT	○	○			
SCHOOL BUS STOPS ON HIGH-SPEED HIGHWAYS	○				
NEW CRASH FORM IMPLEMENTATION	○			○	
LOW LIGHTING	○	○		○	

OPERATIONAL CONCERNS	IMPROVE SAFETY	INCREASE RELIABLE TRAVEL	ENHANCE USER EXPERIENCE	IMPROVE RESOURCE MANAGEMENT	INTEGRATE TSMO INTO ALASKA DOT&PF
WINTER WEATHER MAINTENANCE	○	○	○	○	○
WORK ZONES	○	○	○	○	○
EMERGENCY MANAGEMENT	○	○	○	○	○
ASSET MANAGEMENT (FIELD DEVICES)		○	○		
INCIDENT MANAGEMENT	○	○	○		○
SIGNALS	○	○	○	○	○
FERRIES	○		○	○	
AIRPORTS	○		○	○	
INTERMODAL CONNECTIONS	○		○		
FREIGHT (SIZE AND WEIGHT RESTRICTIONS)	○		○		
MULTIMODAL (IN SMALL COMMUNITIES)	○		○		

CONGESTION CONCERNS	IMPROVE SAFETY	INCREASE RELIABLE TRAVEL	ENHANCE USER EXPERIENCE	IMPROVE RESOURCE MANAGEMENT	INTEGRATE TSMO INTO ALASKA DOT&PF
WINTER WEATHER MAINTENANCE	○	○	○	○	○
WORK ZONES	○	○	○		○

The respondents were then asked to identify what the effects the safety, operational and congestion concerns had on the public, emergency service providers and the agency. The respondents were given a list to rank and asked to add any other effects they might have seen. The effects were then mapped to the goals and objectives that the DOT&PF had developed in order to determine how those effects impacted the goals that the department had identified.

EFFECTS OF SAFETY, OPERATIONAL, AND CONGESTION CONCERNS	IMPROVE SAFETY	INCREASE RELIABLE TRAVEL	ENHANCE USER EXPERIENCE	IMPROVE RESOURCE MANAGEMENT	INTEGRATE TSMO INTO ALASKA DOT&PF
LONG DETOURS / DELAY		○	○		
POOR PUBLIC PERCEPTION			○		
NO DETOURS			○		○
LONG EMERGENCY RESPONSE TIMES	○	○	○		
LACK OF INFORMATION TO THE PUBLIC			○		
REDUCED ACCESS TO ISOLATED COMMUNITIES			○		○
ADDITIONAL RESOURCE EXPENDITURES BY DOT&PF OR OTHER PUBLIC AGENCIES	○			○	○
LACK OF COORDINATION WITH EMERGENCY SERVICE PROVIDERS		○		○	○
SECONDARY CRASHES	○				
AGGRESSIVE DRIVING	○		○		
LACK OF MULTIMODAL OPTIONS	○				○
LOSS OF PRODUCTIVITY					○
INCREASED FATALITIES AND SERIOUS INJURY CRASHES	○				
LOSS OF LIFE IN POTENTIALLY SURVIVABLE CRASHES DUE TO DELAYED ACCESS TO EMS	○	○			
LACK OF INFORMATION FOR THE DOT&PF TO DO FUTURE PLANNING	○				○
LACK OF COORDINATION / COOPERATION BETWEEN DOT&PF AND THEIR PARTNERS					○
ROAD CLOSURES THAT IMPACT BUSINESS			○		

EXISTING TSMO STRATEGIES IMPLEMENTED

Alaska DOT&PF has many TSMO strategies already implemented, although they may not be widespread across the state. The TSMO strategies may be at different levels of maturity across the state based on each Region's history and experience with the particular strategy.

EXISTING TSMO STRATEGIES

SAFETY

- Speed feedback signs, especially ahead of tight curves
- Dynamic messaging signs
- 511 notifications
- Active advance warning flashers at signals

OPERATIONAL

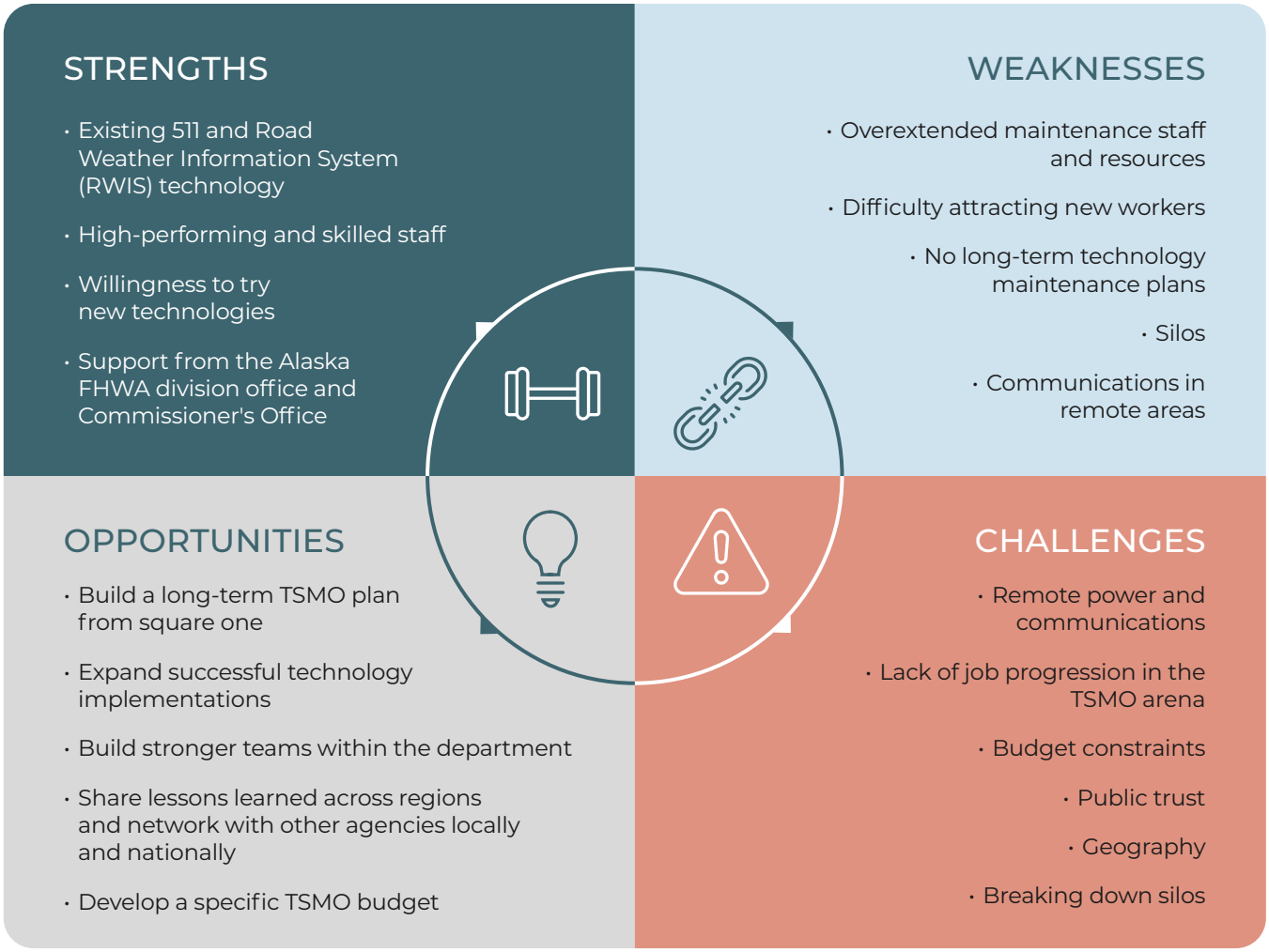
- Alaska Project Exchange Mapper (APEX)
- Dynamic messaging signs
- Developing a GIS route optimization for snow plowing and snowplow tracking
- Signal preemption for snowplows in Northern Region (not yet installed)
- Adaptive signal control and networked signals
- Mobile road condition reporting through 511
- Enhance the Maintenance Decision Support System (MDSS) utilized by maintenance and operations
- Limited Work Zone Data Exchange (WZDx)

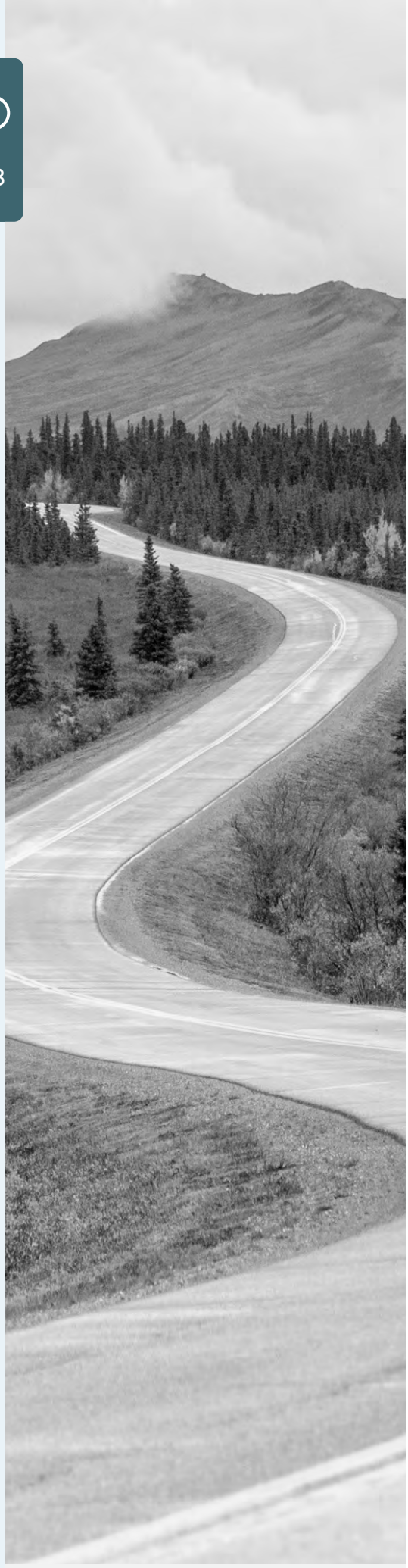
CONGESTION

- Peak and off-peak signal timing
- 511
- Law enforcement traffic control
- Detours
- Traveler information
- Dynamic messaging signs
- Automated Signal Performance Measures
- Adaptive Signal Control
- Staff training
- Incident management
- Scheduling construction work for low-volumes times of day

SWOC AND GAP ANALYSIS

In a workshop, the DOT&PF performed a Strengths, Weaknesses, 0pportunities, and Challenges (SWOC) analysis. The goal of the SWOC analysis is to identify where the DOT currently is in terms of TSMO implementation and where quick wins can be made. Conversely what areas of TSMO would be more challenging to improve because of the institutional barriers. The following graphic shows the strengths, weaknesses, opportunities, and challenges that were identified by the internal Alaska DOT&PF stakeholders.





4 TSMO Strategy Recommendations

The intent of this Alaska DOT&PF TSMO Strategic Plan was to identify and develop strategies. Specific projects and locations are not located in this document, allowing Alaska DOT&PF to establish common strategies throughout the state, to then allow the Alaska DOT&PF to identify locations for improvements. Prior to the finalization of recommendations, there was a review of national best practices for TSMO. Alaska has some unique challenges that differ from the other 49 states, however, identifying where there may be commonalities was key in the development of the final recommended strategies.

NATIONAL BEST PRACTICES / STRATEGIES

- REAL-TIME TRAVELER INFORMATION
- TRANSIT MANAGEMENT
- VULNERABLE ROAD USER (VRU)
- RURAL / REMOTE TSMO SOLUTIONS
- TSMO PRIORITIZATION AND ANALYSIS
- TSMO WORKFORCE DEVELOPMENT
- TECHNOLOGICAL ADVANCEMENTS

The table on the following page summarizes the national best practices the team identified and their applicability to the DOT&PF.

NATIONAL BEST PRACTICES AND THEIR APPLICABILITY

STRATEGY/BEST PRACTICE	APPLICABILITY TO ALASKA DOT
REAL-TIME TRAVELER INFORMATION	The Alaska CAV Strategic Plan (2021) identifies a pilot opportunity to utilize third-party (e.g., Waze) and social media platforms to expand the capabilities of the 511 system. This pilot would enable 511 operations to both capture real-time updates from users/travelers and transmit safety messages and other real-time updates to travelers through their mobile applications.
TRANSIT MANAGEMENT	Evaluate opportunities to expand transit service with micro transit options (including to support increased paratransit use in winter conditions) and expanding transit signal priority use in urban areas. Improve reliability and frequency of transit service.
VRU MOBILITY MANAGEMENT	Alaska's Non-motorized Plan should be referenced as a starting point for understanding the gaps in the mobility network (e.g., non-motorized options) Alaska's 2023-2027 Strategic Highway Safety Plan, Appendix E: Vulnerable Road User Safety Assessment section should be referenced. The appendix include a set of strategies, based on a data driven analysis, to reduce the safety risks to vulnerable road users. (https://dot.alaska.gov/stwdplng/shsp/assets/AKDOT_VRU_Draft-11-14-23_signed.pdf) Identify ITS technologies that can capture multi-modal data such as probe data sources and new sensors.
RURAL/REMOTE TSMO SOLUTIONS	The Alaska TSMO plan needs to respond to the unique demographic, roadway conditions and population demands of the Alaska area.
TSMO PRIORITIZATION AND ANALYSIS	The Alaska TSMO Strategic Plan needs a sustainable and equitable approach towards funding projects. When multiple projects are in consideration, it becomes key to have a selection process in place already so that budgets are allocated to projects that fit the overall TSMO vision of the region.
TSMO WORKFORCE DEVELOPMENT	The Alaska TSMO Strategic Plan needs a workforce plan to ensure that there is a skill-based match to the oncoming changes in technology.
TECHNOLOGICAL ADVANCEMENTS	Advanced technologies keep the agency informed of the changes to come and to understand the impacts of day-to-day decisions and how they align with future technologies.

National best practices provide a framework and key research into TSMO strategies that have been tested and allow Alaska DOT&PF to investigate and implement based on applicability and benefits shown in the test use cases.

RATING CRITERIA DEVELOPMENT

To create a prioritized list of strategies, criteria were developed and selected. The criteria will support development of a prioritized list of TSMO strategies which help allocate funding and other resources efficiently, address critical issues and Alaska DOT goals first, and maximize the impact of improving the transportation system. The criteria and strategies selected are a culmination of previous stakeholder meetings which include Vision, Goals and Objectives creation, completing the Capability Maturity Model (CMM) Self-Assessment, and conducting a Strength Weakness Opportunities and Challenges (SWOC) and Gap analysis. These meetings served as the foundation for the TSMO Strategic Plan and provided a needs assessment for TSMO within Alaska DOT&PF.

The TSMO strategies are classified into nine categories which are based on the FHWA TSMO program areas and encompass a wide range of activities and applications. These strategies aim to enhance the overall mobility, safety and efficiency of the transportation system and ensure alignment with the Alaska DOT&PF goals and objectives.

- **Arterial Management**
- **Active Transportation and Demand Management**
- **Data Collection**
- **Traffic Incident Management**
- **Road Weather Management**
- **Work Zone Management**
- **Real-time Traveler Information**
- **Emergency Transportation Operations**
- **Workforce development**

Within each of the nine categories, there are multiple strategies associated with the program areas. These strategies were measured on a number of criteria, with the initial measurement being the existing conditions. The existing conditions measurement answered the following questions: *Is the strategy implemented already? Are there any identified concerns? Are there identified issues to be resolved?*

Understanding where Alaska DOT&PF currently stands with the strategies creates a baseline understanding of the current state of TSMO strategies and allows the focus to be shifted to strategies which will address specific needs and challenges.

Once the baseline for current TSMO strategies was set, the strategies were assessed on their effectiveness based on the below criteria. The evaluation of TSMO strategies allows Alaska DOT&PF to make informed decisions, prioritize the effectiveness of the strategies and understand how they will improve the management and operations of the transportation system.

- **Alignment with goals and objectives**
- **Cost and benefit/cost ratio**
- **Timeframe**
- **Existence of communications equipment/ ability to add communications**
- **Issue/solution documented in statewide/ regional plan**
- **Statewide applicability**
- **Staff availability**
- **Staff readiness**
- **Tactic readiness**

BARRIERS

The final piece of the evaluation was evaluating the barriers to success associated with each of the strategies. Identifying and addressing these barriers is critical for overcoming challenges and ensuring the successful implementation of TSMO strategies and institutionalizing them into Alaska DOT&PF.

- **Institutional Barriers**
- **Technology Barriers**
- **Infrastructure Barriers**

TSMO STRATEGY RANKING

THE STRATEGY EVALUATION

The above systematic approach was created to ensure a comprehensive evaluation of the TSMO strategies to determine their prioritization within each category based on a defined set of criteria which reflect the goals and needs of Alaska DOT&PF.

Below are example prioritizations based on B/C and implementation timeframe. These prioritization types may be used to select specific projects within each category when necessary.

Strategies may impact more than one goal area. The point of the exercise was to identify those strategies with a high benefit/cost ratio and high readiness. Those strategies would be good candidates for early implementation.

The table below indicates which strategies are highly rated for benefit/cost and readiness.

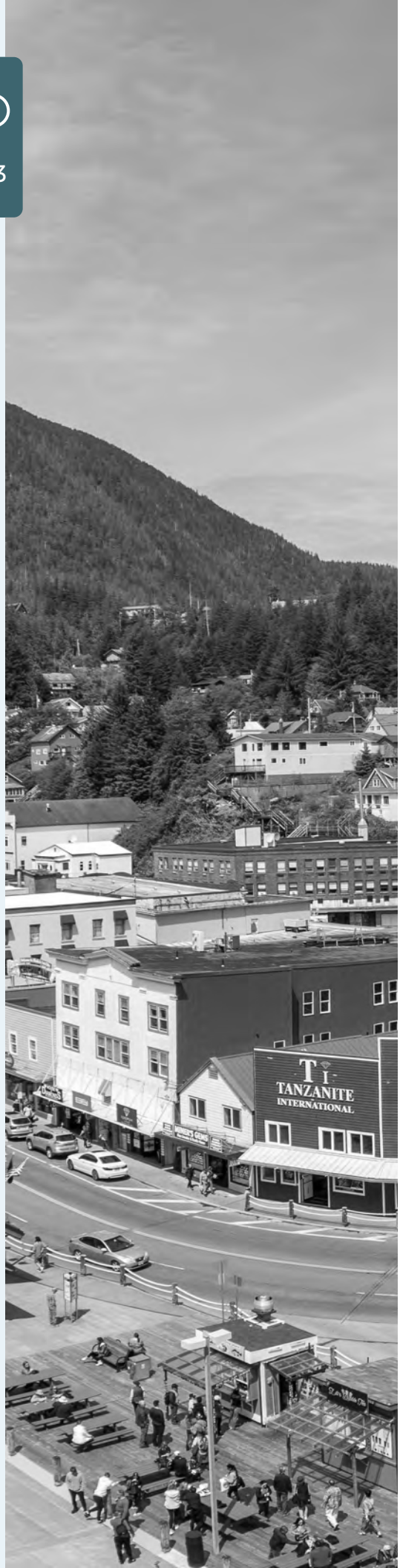
STRATEGY ASSESSMENT OF BENEFIT/COST AND READINESS

TYPE	STRATEGY	HIGH B/C	HIGH READINESS
ARTERIAL MANAGEMENT			
	Enhanced Signing along arterials at both signalized and stop controlled intersections along with signage along the road to provide early warning to drivers for various hazards (i.e. curves, hills, intersections, etc).	○	○
	Time of day signal timing plans	○	
	Expand the use of RRFB's or other enhanced crossings	○	○
	Expand use of Automated Signal Performance Measures	○	
	Expand use of Adaptive Signal Control	○	
	Expand Networked signal systems	○	
	Push Buttons		○
ACTIVE TRANSPORTATION AND DEMAND MANAGEMENT			
	Enhanced Signing on highways	○	○
	Expand use of Rumble and Mumble Strips	○	○
	Improve Pedestrian access to Transit in urban areas	○	○
	Variable speed limits		○
	Driver Feedback System at Curves	○	

TYPE	STRATEGY	HIGH B/C	HIGH READINESS
TRAFFIC INCIDENT MANAGEMENT			
	After Action Debriefs	○	○
	Emergency Management (Flooding, Avalanche, Landslides, Earthquakes, Wildfires)	○	
	TIM Teams	○	
	TIM Training	○	
	Response Plans, Exercises	○	
	Incident management (on-road - includes staffing and vehicles)	○	
	Dedicated Incident Response Staff (Internal)	○	
ROAD WEATHER MANAGEMENT			
	Expand the use of MDSS by maintenance and operations	○	○
WORK ZONE MANAGEMENT			
	Advance Workzone Warning	○	
REAL-TIME TRAVELER INFORMATION			
	AKDOT Projects Website (APEX)	○	○
EMERGENCY TRANSPORTATION OPERATIONS			
	Increase Coordination with Local Governments	○	
	Asset Management (Field Devices)	○	
	Statewide Operations Center	○	
WORKFORCE DEVELOPMENT			
	TSMO Workforce Development	○	○

The strategy evaluation, as stated previously, is a systematic approach which can be reviewed as needs, goals, and technology change. The evaluation system is meant to be a "living" strategy evaluation and should be reviewed on a yearly basis to ensure that the TSMO strategies are up to date and serving the needs of the DOT. The goal of the evaluation and prioritization is to provide a data driven approach for Alaska DOT&PF to make informed decisions on TSMO strategy and technology implementations across the Alaska transportation system, providing all modes of travel with a safe and efficient system.

The TSMO Strategic Plan is a living document that should be updated as strategies are implemented, needs change or technologies evolve. Changes in technology may make some strategies obsolete and others easier to implement.



5 TSMO Program Recommendations

This section provides a list of high-level recommendations for the Alaska DOT&PF for the Statewide TSMO Program. The recommendations are for future actions to support the mainstreaming of Transportation System Management and Operations (TSMO) within the Department.

The future actions are the combination of needs and gaps realized through previous stakeholder workshops including the Vision, Goals and Objectives creation, completing the Capability Maturity Model (CMM) Self-Assessment, and conducting a Strength Weakness Opportunities and Challenges (SWOC) and Gap analysis. These workshops and outcomes will serve as the foundation for the TSMO Strategic Plan and provide an understanding for the Alaska DOT&PF of the needs and steps to grow and expand the TSMO program. By addressing the action areas, Alaska DOT&PF can effectively prepare for integrating TSMO into the Department and enhance the efficiency, reliability, and safety of the transportation system.

RESEARCH NEEDS

Research studies play a critical role in advancing TSMO, driving innovation, improving performance of the transportation network, and addressing the complex challenges faced by Alaska DOT&PF based on the varying topography and weather of the state. The future research needs will support the development and implementation of TSMO actions within the Department. This research could be carried out by the Department, participation in pooled fund studies or problem statements for NCHRP. The following key strategic areas are recommended for future research:

TSMO GUIDEBOOKS

Integrating TSMO into the Department requires a comprehensive roadmap and a guidebook (or series of guidebooks) provides a description of incorporating TSMO into the Alaska DOT&PF approach to TSMO. Several states, and the NCHRP, have completed guidebooks and can be used as frameworks for the Department to craft and integrate guidebooks into the TSMO program.

EXPERIMENTAL PROJECTS

Incorporating new technologies in upcoming projects can serve the Department as a testbed for implementing and evaluating new technologies and understanding if the technology provides benefits for broader deployment. Experimental projects are vital in the data driven decision making process on new technologies and provide the TSMO program with key information and insights to the benefits of the technologies. In addition, the Bipartisan Infrastructure Law (BIL) provides several grant opportunities for funding existing technology expansion or new technologies.

DATA CHALLENGES

Crowdsourcing to improve traveler information and operations is a critical source of data which the Department can integrate into the decision-making process. Crowdsourcing turns transportation system users into traffic sensors, generating data that improve real-time operations and enhance the overall management of transportation systems[1]. There are multiple avenues for crowdsourcing which can be evaluated and include social media, third-party sources (WAZE, INRIX, HERE), and DOT&PF developed apps which capture road user information. The ability to pull and incorporate the crowdsourced data into Alaska DOT&PF traveler information tools would enhance the information which can be provided to travelers. State DOTs such as Utah DOT, have created apps which allow citizens to report and submit hazardous road conditions. Providing an outlet for travelers to submit real-time information is of great value to crowdsourcing transportation information.

Additionally collecting data on the condition of TSMO assets can be challenging, however, developing a system that collects data on asset conditions, develops and tracks work orders can help the agency understand the actual costs of its TSMO program.

STAFFING REQUIREMENTS

Understanding and identifying gaps in staffing to support TSMO activities within Alaska DOT&PF are key to the growth of the TSMO program. These gaps could include positions in planning, project development, maintenance and operations, IT support or performance measures. The roles may be filled by dedicated TSMO staff or through collaboration with other DOT departments, consultants, and partner organizations. Utilizing all available resources is integral in providing staffing solutions when minimal staff is available. Additional staffing capacity will be required in the Data Modernization and Innovation Office.

- As the TSMO program grows, staffing numbers and positions must grow to ensure that the program area can operate and function. As new technologies and programs are implemented, corresponding staffing adjustments will need to be made. In addition, new avenues for obtaining and retaining staff will need to be researched.

BUDGET

Identifying budget needs for TSMO activities, particularly maintenance and operations of existing assets and operating specific programs will be helpful in ensuring those programs are adequately funded.

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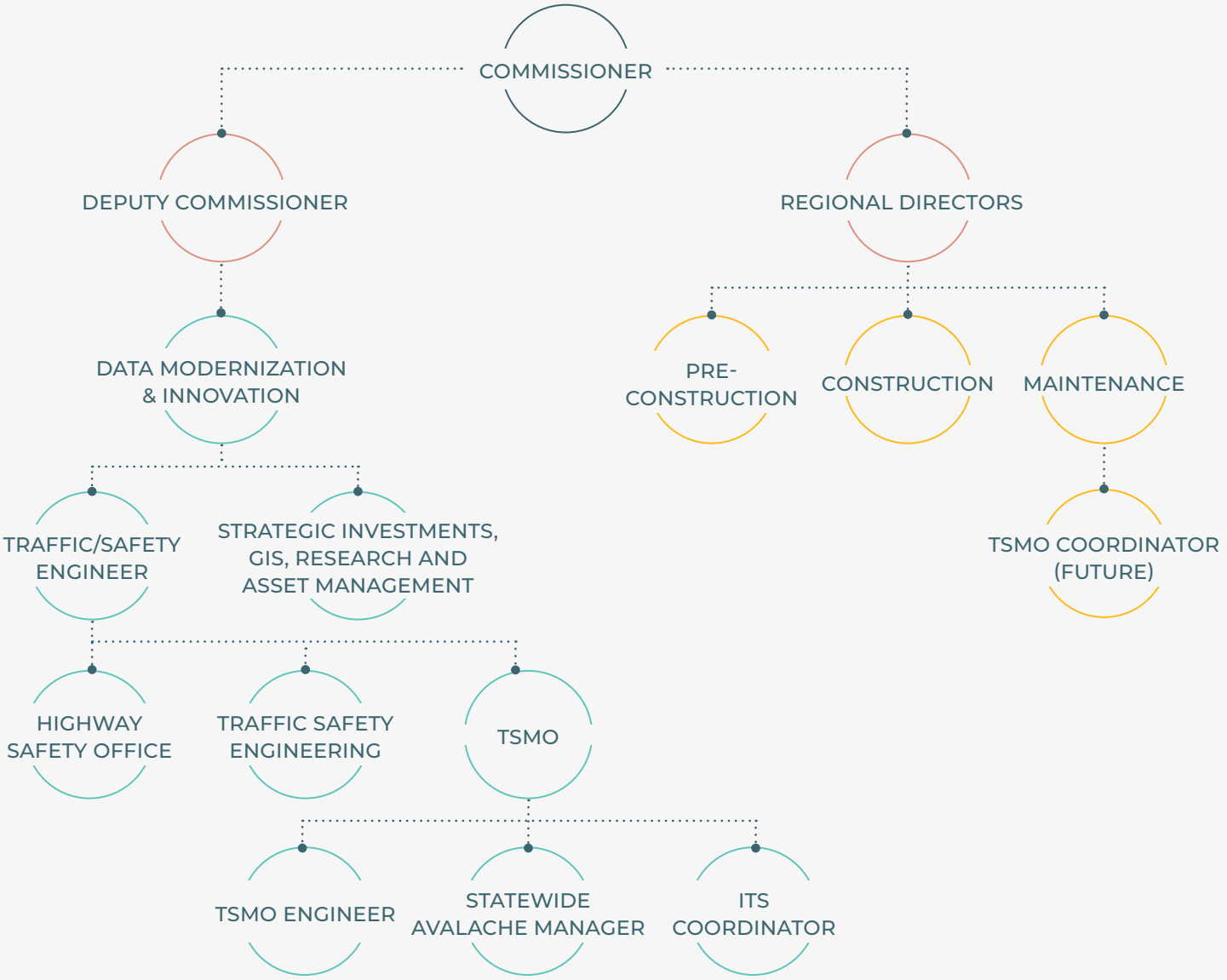
1 https://highways.dot.gov/public-roads/autumn-2019/crowdsourcing-improve-traveler-information-and

ORGANIZATIONAL STRUCTURE

Identifying potential changes to Alaska DOT&PF's organizational structure that would support the mainstreaming of TSMO and improve the effectiveness of TSMO within the agency are critical to the viability of the TSMO program. Below is an organizational chart that shows the areas of the Department which have TSMO functions as part of the responsibilities. The amount of TSMO responsibilities may vary depending on the group. For instance, the statewide TSMO Engineer may focus nearly exclusively on TSMO issues while the GIS Group in the Data Modernization and Innovation Office would provide mapping to support TSMO but have a broader set of GIS responsibilities.

The organizational structure of the TSMO program will be fluid as technologies and programs are added to the overall program. Identifying an overarching structure will allow the department to fill in staff to key roles as the program expands. The flexible organizational structure will provide high-level positions which will ensure that the TSMO program is well-coordinated with dedicated staff for different aspects of the program, from planning and implementation to maintenance and communication. These positions may be filled by staff with multiple roles but play a key part in the structure of the program.



TRAINING NEEDS

Identifying training needs for existing or future staff to support TSMO activities is a critical action necessary to expand the TSMO program and the knowledge, skills, and abilities of the staff. Training is not only for new staff but can be to train existing staff on new functions or new position types which are established with the expansion of TSMO programs.

Establishing a TSMO program requires a variety of training programs which can be delivered in various formats, including classroom instruction, online training, workshops, seminars, and hands-on exercises. Additionally, ongoing training and refresher courses are important in keeping current staff up to date on new innovations, technologies, and best practices in TSMO. Recommended training activities include:

STATEWIDE CROSS-TRAINING

Cross-training of staff will assist Alaska DOT&PF in promoting resilience, flexibility, and effectiveness of staff by equipping them with the necessary knowledge, skills, and abilities to successfully implement the TSMO program. Cross-training will provide a multitude of benefits for the Department.

- **Enhanced Understanding/ Improved Problem-Solving**
- **Increased Flexibility**
- **Interdisciplinary Coordination**
- **Resource Utilization**
- **Career Development**

REGION & DISTRICT OPERATIONS

Alaska has a vast and varying landscape from both a topography and climate standpoint. Region & District level operational cross-training is a variation of Statewide cross-training but requires staff to be trained on the varying challenges faced by regions and districts across the state. Understanding these variations provides staffing flexibility and reduces the impacts of staff turnover as staff can cover and understand multiple regions across the state.

TRAFFIC INCIDENT MANAGEMENT (TIM) TRAINING

Statewide Traffic Incident Management (TIM) training is an integral part of a high performing TSMO program. TIM training provides multiple benefits including saving lives, time, and money. TIM training should be provided to all first responders, towing professionals, maintenance staff, safety service patrol staff, dispatch, and other staff, which may be a part of incident response. TIM training provides trainees with the knowledge on how to clear an incident safely and efficiently and provides the opportunity for collaboration and relationship building in a low-stress atmosphere. The relationships, along with the training, are critical in the safe, quick clearance of traffic incidents.

In conjunction with providing the training, Alaska DOT&PF should be recording the trainee information to keep an up-to-date index of who has been TIM trained in the state.

TSMO/ITS TECHNOLOGY TRAINING

Training on new technologies should be provided to all Alaska DOT&PF technicians and maintenance staff who will be responsible for the maintenance of field equipment. Refresher courses should also be made available, whether in person or online, for staff.

Training opportunities for contractors on new technologies should also be made available. Understanding the limits of internal DOT maintenance staff and supplementing efforts with contractor assistance is vital in keeping the transportation system running.

TSMO STAFF NEW TECHNOLOGY TRAINING

Training for current and future TSMO staff in new technologies should be made available to enhance their understanding of these technologies and the benefits they can offer Alaska DOT&PF. Though not all the technologies may be used by the Department currently, understanding their uses for future projects is beneficial in assisting the Department to build infrastructure for future technology integrations.

Technologies may include, but are not limited to:

- **Artificial Intelligence**
- **Connected and Autonomous Vehicles**
- **Cybersecurity**
- **Enhanced traveler information such as in-vehicle communications**
- **Mobile RWIS/Mini RWIS**

TSMO OUTREACH TRAINING

Public education and stakeholder outreach should be provided by the Department as new projects and programs are implemented. Providing information as part of the project initiation provides the public with an understanding of the TSMO and/or ITS strategies which are being implemented. The transparency provided through the outreach increases the public's trust in the projects being implemented by the Department.

POLICY AND PROCEDURES

The following are identified policies and work procedures that could be updated to support the implementation and mainstreaming of TSMO activities. Policies and procedures are vital components of the TSMO program, which provide structure and guidance to achieve the vision and goals of the program set forth by the Alaska DOT&PF.

The creation of new policies and procedures and updating current ones is important to a growing and expanding TSMO program. The new and/or updated policies and procedures aid in building consistency, standardizing activities, and ensuring continuous improvement across the program. The following policy and procedure recommendations support standardized growth and expansion of the TSMO program.

PLANNING & PROJECT DEVELOPMENT

Integrating TSMO into the planning, scoping and project development process is an important step in integrating TSMO into the whole of the Alaska DOT&PF. The planning and scoping phases as well as the early stages of the project development process are a key place to integrate TSMO strategies into upcoming projects.

STANDARDIZED DATA

Standardizing data across the Alaska DOT&PF is critical to the efficiency, effectiveness and transparency of project data. The seamless exchange of data is crucial to the interoperability of systems and for the ability to display and share data efficiently across a variety of stakeholders. Standardized data enables a comprehensive and insightful analysis of the transportation network. The following are recommendations to create standardized and structured data and data analysis.

- **Data quality standardization**
- **Creation of performance measure/reporting Hub**
- **Creation of Statewide transportation TSMO dashboard visualization**

STANDARDIZED COMMUNICATION PROTOCOLS

Standardizing communication protocols will reduce confusion and increase efficiency in communications as standard communications procedures will be followed by all staff.

- **Standardizing both internal and external communication procedures**

STANDARDIZED ITS EQUIPMENT

Standardizing ITS equipment reduces maintenance training needs as similar equipment is used across the state and provides opportunities for project equipment bundling.

- **Standardized ITS Equipment**

CONTINUITY OF OPERATIONS (COOP)

COOP plans provide standardized and documented procedures to ensure that essential functions of the TSMO department can continue in response to emergencies that threaten normal operations. COOP plans ensure that the Department can mitigate risks during emergency events and create a resilient transportation network.

6 Initial Implementation

This section focused on strategies that the Alaska DOT&PF can implement in the near term. The recommendations are tiered in those strategies that can be initiated in one to three months, three to six months, and in 6 to 12 months.

Tier 1 strategies are low cost, not very resource intensive and have no dependencies so they can start being implemented quickly. Tier 2 strategies take more time to implement and take more preparation to implement. Tier 3 strategies take longer to implement and have some dependencies.

TIER 1 – START IN THE NEXT 1 - 3 MONTHS.

- Select an existing (or near-term planned) TSMO Project and create a fact sheet to highlight the benefits of the project (e.g., weather-based variable speed limits on the four-lane section of the Richardson Highway between Fairbanks and Eielson Air Force Base).
- Review existing planning and scoping policies and practices to ensure that staff have policy guidance to support planning for TSMO projects and implementing TSMO elements in other projects.
  - » Ensure local agency plans evaluate TSMO strategies.
  - » Review project scoping documents and guidance to ensure that TSMO solutions are considered as alternatives to address transportation problems and TSMO elements are included in traditional projects.
  - » Review project development document practices, procedures and documents to ensure that TSMO elements are included in traditional projects.
- Establish temporary or interim TSMO coordinators in each Region while working toward creating permanent positions.

TIER 2 – START IN NEXT 3 - 6 MONTHS.

- Develop or implement training for TSMO.
  - » NHI Courses on Planning for TSMO is a good example.
  - » The Operations Academy offers intensive training for some key staff.
- Develop a data management task force including teams focused on:
  - » Data collection,
  - » Data use, and
  - » Performance measures.
- Establish a cross-disciplinary traffic incident management team, either at the statewide level focused on policy or pilot a local team.
- Develop Region TSMO plans to focus on project implementation.
- Submit a BIL Grant application such as RAISE, ATTAIN, or SMART Grant with a TSMO emphasis (e.g., a PROTECT grant, possibly focused on severe storms, earthquake and tsunami preparedness).
- Schedule and hold a Statewide TSMO meeting. This would be a regular (annual or biannual) meeting.

TIER 3 – START IN NEXT 7 - 12 MONTHS.

- Develop a TSMO Guidebook focused on Alaska's unique needs.
  - » Develop a catalog of TSMO solutions and possible funding sources.
- Formalize a task force with the Department of Public Safety to determine the process to implement a joint operations center.
- Identify and inventory existing TSMO equipment to:
  - » Begin developing an asset management framework.
  - » Determine which equipment should be standardized across the state.
- Identify updates to the TSMO plan as projects and programs are implemented, including adding airports and ferries into the plan.
- Develop budget and organizational structures to support TSMO.